

QH  
301  
J75

# JOURNAL OF THEORETICAL BIOLOGY

*Chief Editor:* J. F. DANIELLI

*Associate Editor:* L. WOLPERT

*Assistant Editor:* D. GINGELL

*Editorial Board:*

E. A. BARNARD

H. BREMERMAN

M. CALVIN

J. D. COWAN

D. A. GLASER

B. GOODWIN

J. J. B. JACK

J. MAYNARD SMITH

D. MAZIA

B. C. PATTEN

C. H. WADDINGTON

M. YČAS

J. Z. YOUNG

U. of ILL. LIBRARY

NOV 17 1973

CHICAGO CIRCLE

VOLUME 40

*July to August 1973*



ACADEMIC PRESS  
London and New York

# JOURNAL OF THEORETICAL BIOLOGY

Chief Editor: J. F. DANIELL  
Associate Editor: L. WOLPERT  
Assistant Editor: D. GINGELL

Copyright © 1973, by Academic Press Inc. (London) Ltd.

ALL RIGHTS RESERVED

No part of this volume may be reproduced in any form, by photostat, microfilm, or any other means, without written permission from the publishers.

D. A. GLASER  
B. GODWIN  
J. L. B. JACK  
J. MAYNARD SMITH  
D. MASIA  
R. C. PATTER  
C. B. WADDINGTON  
M. YCA  
A. Z. YOUNG

VOLUME 40

1973

ACADEMIC PRESS  
New York

Printed in Great Britain



# Contents of Volume 40

Number 1, July 1973

SILVER, W. S. and POSTGATE, J. R., Evolution of Asymbiotic Nitrogen Fixation . . . . .	1
HUANG, H. W., Mobility and Diffusion in the Plane of Cell Membrane . . . . .	11
BORST-PAUWELS, G. W. F. H., Two Site-Single Carrier Transport Kinetics . . . . .	19
BARKER, S. B., CUMMING, G. and HORSFIELD, K., Quantitative Morphometry of the Branching Structure of Trees . . . . .	33
ZHABOTINSKY, A. M. and ZAIKIN, A. N., Autowave Processes in a Distributed Chemical System . . . . .	45
PFAFFELHUBER, E., Mathematical Learning Models and Neuronal Networks . . . . .	63
WONG, R. and HARTH, E., Stationary States and Transients in Neural Populations . . . . .	77
KEMENY, G. and GOKLANY, I. M., Polarons and Conformons . . . . .	107
CHANG, K.-J. and TRIGGLE, D. J., Quantitative Aspects of Drug-Receptor Interactions I. $\text{Ca}^{2+}$ and Cholinergic Receptor Activation in Smooth Muscle: A Basic Model for Drug-Receptor Interactions . . . . .	125
CHANG, K.-J. and TRIGGLE, D. J., Quantitative Aspects of Drug-Receptor Interactions II. The Role of $\text{Ca}_{\text{mem}}^{2+}$ in Desensitization and Spasmolytic Activity . . . . .	155
SEELY, G. R., Effects of Spectral Variety and Molecular Orientation on Energy Trapping in the Photosynthetic Unit: A Model Calculation . . . . .	173
SEELY, G. R., Energy Transfer in a Model of the Photosynthetic Unit of Green Plants . . . . .	189
LETTERS TO THE EDITOR	
LESK, A. M., On Hypothesized Selective Pressure by u.v. on DNA Base Compositions . . . . .	201

MACKAY, A. L., How to Organize a Typists' Pool—An Operational Analysis of an Old Metaphor . . . . .	203
Announcement . . . . .	205
<i>Number 2, 15 August 1973</i>	
VINE, I., Detection of Prey Flocks by Predators . . . . .	207
KIER, L. B., Chlorpromazine and Serotonin: Conformational Similarities Correlating with Activities . . . . .	211
HATZE, H., A Theory of Contraction and a Mathematical Model of Striated Muscle . . . . .	219
MOFFAT, J. B., The Protonation of Peptides. A Non-empirical Theoretical Study . . . . .	247
DOGONADZE, R. R., ULSTRUP, J. and KHARKATS, YU. I., A Theory of Polar Medium Electron Transfer Reactions through Bridge Groups with a Quasicontinuous Energy Spectrum . . . . .	259
DOGONADZE, R. R., ULSTRUP, J. and KHARKATS, YU. I., A Theory of Bridge-assisted Polar Medium Electron Transfer Reactions between Molecules Having Quasicontinuous Electronic Energy Spectra. . . . .	279
RILEY, W. T., Amino Acid Sequences and Double-stranded Messages—A Means of Directing the Site of Mutation? . . . . .	285
ISHIDA, K., Non-equilibrium Thermodynamics of Marginal- and Conditional-Open Chemical Systems . . . . .	301
YOUNG, J. H., Membrane Tubularization and Osmotic Swelling in Mitochondria . . . . .	329
RAND, W. M., A Stochastic Model of the Temporal Aspect of Breeding Strategies . . . . .	337
CLAXTON, J. H. and SHOLL, C. A., A Model of Pattern Formation in the Primary Skin Follicle Population of Sheep . . . . .	353
CAPOCELLI, R. M. and RICCIARDI, L. M., A Continuous Markovian Model for Neuronal Activity . . . . .	369
LETTERS TO THE EDITOR	
GURTIN, M. E., A System of Equations for Age-Dependent Population Diffusion . . . . .	389

# CONTENTS

v

GEORGE, J. M. and KIER, L. B., Conformation of Thyrotropin-Releasing Hormone: Prediction from Molecular Orbital Theory . . . . .	393
HILL, L. R., A Fault in Pratt's Critique of Numerical Taxonomy?	397
MARKOWITZ, D., Generalized Complementarity Re-entered .	399
JAKOBSSON, E., Response to "Generalized Complementarity Re-entered". . . . .	403

## Number 3, 22 August 1973

GILLESPIE, C. J., Towards a Molecular Theory of the Nerve Membrane . . . . .	409
CZAPLEWSKI, R. L., A Methodology for Evaluation of Parent-Mutant Competition using a Generalized Non-linear Ecosystem Model	429
GIESSNER-PRETTRE, C. and PULLMAN, B., Molecular Orbital Calculations of the Proton-Proton Coupling Constants in Nucleosides	441
KIGER, J. A. JR., The Bithorax Complex—A Model for Cell Determination in <i>Drosophila</i> . . . . .	455
POLAK, E. H., Multiple Profile-Multiple Receptor Site Model for Vertebrate Olfaction . . . . .	469
BOLING, R. H. JR., Toward State-Space Models for Biological Populations . . . . .	485
NICKERSON, K. W., Biological Functions of Multistable Proteins .	507
FITZHUGH, R., Dimensional Analysis of Nerve Models . . . .	517
GOOD, P. I., Alternative Mechanisms for Homeostatic Regulation of Mammalian Cell Populations . . . . .	543
SINGH, U. N., Polyribosomes and Unstable Messenger RNA. III. Temporal Relationship Between the Syntheses of mRNA and Inducible Enzyme . . . . .	553
GRANLUND, G. H., The Use of Distribution Functions to Describe Integrated Density Profiles of Human Chromosomes . . .	573
SCHREINER, K. E., Geometrical Restrictions on Cross-bridge Motion and Sliding Filament Dynamics . . . . .	591

## LETTERS TO THE EDITOR

RUSE, M., On the Supposed Incoherence of Numerical Taxonomy 603

KETLEY, J. N. and KETLEY, A. D., A Suggested Function of  
RNA-linked Fragments in DNA Replication . . . 607